REPORT OF INVESTIGATION OF PRACTICES OF THE OIL AND GAS INDUSTRY IN MISSISSIPPI AT CLASS II DISPOSAL WELLS AND REGULATION OF CLASS II WELLS BY THE MISSISSIPPI STATE OIL AND GAS BOARD

July 26, 2021

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EXECUTIVE SUMMARY

This Report details findings of our investigation into certain practices of the oil and gas industry in Mississippi that violate state and federal laws intended to protect the environment generally and drinking water specifically. These violations are potentially an immediate and detrimental danger to drinking water sources throughout the State of Mississippi. Due to a lack of reporting, the breadth and scope of these dangers are unknown, thus creating the need to raise this information to the highest levels of authority. For the sake of public health and disclosure, we are sharing this information with the Mississippi Department of Environmental Quality and the Mississippi Department of Health.

Additionally, we detail failings of the Mississippi Oil and Gas Board ("MOGB") which have allowed the flagrantly unlawful and unsafe practices of the oil and gas industry to continue unabated for decades. Despite the MOGB having primacy over the Underground Injection Control program in Mississippi, it does not require disposal well operators to obtain aquifer exemptions. The MOGB does not monitor and regulate injection pressures of disposal wells as required by section 1422 of the Safe Drinking Water Act ("SDWA") and improperly permits commercial disposal wells. The inaction and inability of the MOGB to discharge its duties as required by the authority granted to it by the EPA endangers the environment and health of Mississippi citizens. We ask that you open an investigation into these matters immediately and take appropriate steps to insure Mississippians are, at a minimum, being protected by the federal standards under the SDWA.

VIOLATIONS OF FEDERAL SAFE DRINKING WATER ACT'S UNDERGROUND INJECTION CONTROL PROGRAM BY MISSISSIPPI OIL AND GAS BOARD

Citizens want to believe governmental agencies act to protect their rights and promote their well-being. Citizens *need* to believe that their drinking water is safe.

In 1966, an associate general counsel for Mobil Oil Company stated:

> Let's face it, many people believe that the pollution of our streams, lakes, and rivers has become a national disgrace. Just a few generations ago this country was blessed with one of the world's richest treasures -- an abundant water supply. Partly through ignorance and through lack of planning, we have turned this 'primary source of life' into a sort of handy "disposal' or 'instant sewer.'

The Safe Drinking Water Act ("SDWA") was passed into law in 1974. *See* 42 U.S.C. §§ 300f *et seq.* (1974). The SDWA is intended to protect public health by regulating the nation's public drinking water supply. Under the SDWA, the US Environmental Protection Agency ("EPA") sets national standards for drinking water based on science to protect against health risks, considering available technology and costs.

The SDWA established the Underground Injection Control ("UIC") program. The UIC program sets standards for the underground injection of fluids and fluid wastes through wells that discharge or that may discharge into or above an underground source of drinking water ("USDW"). There are six categories of injection wells under the UIC program. Class II injection wells are used to inject fluids associated with the production of oil and natural gas. Class II wells are also used for enhanced oil recovery.

This Report details findings concerning Well 36-13-1 in the Laurel Field in Jones County, Mississippi. Well 36-13-1 is permitted as a Class II wastewater disposal well. We have extensive evidence of flagrant violations of UIC regulations concerning other wells and believe the practices detailed herein are wide-spread.

Under the UIC regulations, the EPA may delegate primary enforcement authority, often called primacy, to state, territorial or tribal agencies. The State of Mississippi applied for and was delegated primacy by the EPA pursuant to written Agreement. The Agreement was amended on May 5, 1992. Tab A.[1]

The MOGB is the primacy agency in Mississippi. To be delegated primary enforcement agency, the MOGB had to demonstrate to the EPA that it has jurisdiction over underground

[1] Documents referenced in this Report are attached as noted.

injection;[2] has regulations that meet the federal requirements for 1422 programs (or are effective under 40 CFR 1425); and has the necessary administrative, civil and criminal enforcement penalty remedies.

As stated, the primary purpose of the UIC program is protection of USDW. An USDW is an aquifer with sufficient quality and quantity of ground water to supply a public water system now or in the future. 40 CFR 144.3 USDW are contained within underground aquifers. "Aquifer" is defined as a "'geological formation,' group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring." 40 CFR 144.3.

An USDW is defined as an aquifer that:

> I) supplies any public water system; ii) contains sufficient groundwater to supply a public water system AND either currently supplies drinking water for humans OR contains fewer than 10,000 mg/L total dissolved solids (TDS); and iii) is not an exempted aquifer. (See 40 CFR § 144.3.)

At the time the State of Mississippi applied for primacy, it could have submitted underground aquifers that do not meet the criteria for an USDW to the EPA for exemption from the UIC program. If the required showings were made, the EPA would have exempted those aquifers from the UIC program in Mississippi. The EPA's web site reflects that there are no exempted aquifers in Mississippi, and it was confirmed by the MOGB in response to an information request.

If the zone into which a Class II well operator proposes to inject is not an exempted aquifer, the operator must apply for an aquifer exemption. An aquifer exemption is a regulatory designation available in limited and exceptional circumstances - only if an aquifer is neither a current nor a likely future source of drinking water. Aquifer exemptions are granted only after a stringent application, review, and approval process assures that certain regulatory criteria have been met. These applications are reviewed at the federal and/or state level or tribal level (depending on primacy) and then sent to EPA (where a final determination is made). The process for obtaining an aquifer exemption is detailed and requires the submission of extensive technical data and a public notice and comment period. Because the MOGB has never required or approved an aquifer exemption, there are no criteria for such exemptions in Mississippi. Still, there are states within EPA Region 4 that have been granted primacy and have used the application, review and approval process as outlined under in the SDWA. Attached at Tab B is an EPA Memorandum which details the aquifer exemption process and includes an aquifer exemption checklist.

If the MOGB followed and enforced the UIC regulations, a well operator would submit its application for an aquifer exemption to the MOGB which would review the application, provide a public notice and comment period and then make its recommendation concerning approval or denial

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[2] *See*, discussion below on the MOGB's improper permitting of commercial Class II disposal wells.

of the exemption. The application would then be forwarded to the EPA's Regional Administrator in Atlanta for final approval. The regulations provide that the EPA must approve aquifer exemptions, and there are no regulatory loopholes or exceptions which would permit the MOGB to approve an exemption. The EPA reviews the data the primacy state reviewed and provides a second public notice and comment period. Afterwards, the EPA Regional Administrator makes a final decision which is reviewable by the EPA administrator.

Pursuant to 40 CFR 147.2908:

> (b) An aquifer or its portion that meets the definition of a USDW may be exempted by EPA from USDW status if the following conditions are met:
>
> (1) It does not currently serve as a source of drinking water, and
>
> (2) It cannot now and will not in the future serve as a source of drinking water because:
>
> (I) It is hydrocarbon producing, or can be demonstrated by a permit applicant as a part of a permit application for a Class II operation to contain hydrocarbons that are expected to be commercially producible (based on historical production or geologic information); or
>
> (ii) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical; or
>
> (iii) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or
>
> (3) The Total Dissolved Solids content of the groundwater is more than 3,000 and less than 10,000 mg/1 and it is not reasonably expected to supply a public water system.

We have confirmed with the EPA and the MOGB that no aquifer exemptions have been granted for any of the 1438 Class II disposal wells in Mississippi, including Well 36-13-1.

With respect to Well 36-13-1, the MOGB did not follow the UIC regulations for an aquifer exemption and did not submit anything to the EPA. The MOGB's January 31, 1996 Order, approving Coho Resources' application for a permit to convert the well into a Class II disposal well states:

> The Board finds that an injection interval should be approved in said well within the Lower Wilcox Formation at a depth of between 3200 feet and 4080 feet below the surface in said well.

* * *

The Board finds that the base of the lowermost Underground Source of Drinking Water ("USDW") in the Laurel Field occurs in the Wilcox Formation at a depth of approximately 2325 feet below the surface . . . .

* * *

The Board finds that any formation water in the proposed injection interval in said well contains in excess of 10,000 parts per million (ppm) of dissolved solids.

A copy of the Order is at Tab C.

The only information in the MOGB's file for Well 36-13-1 regarding the salinity of the water in the injection zone is an affidavit from a petroleum engineer employed by Coho. In that affidavit, the engineer states that the total dissolved solids in the injection zone exceed 10,000 ppm. There is no water sample analysis or other technical data attached to the affidavit to support this statement.

The MOGB's Order for Well 36-13-1 approves injection into the Lower Wilcox. The Wilcox formation is an USDW. In fact, the MOGB's Order approving Coho's application states that it "finds that the base of the lowermost Underground Source of Drinking Water ("USDW") in the Laurel Field occurs in the Wilcox Formation at a depth of approximately 2325 feet below the surface . . . ." In addition, the Hiawannee Water Association in Waynesboro (approximately 25 miles from Laurel) draws its water for the City of Waynesboro from the Lower Wilcox. The Town of Shubuta in nearby Clarke County as well as the Wautubbee and Harmony Water Associations in Clarke County draw water from the Lower Wilcox.

The MOGB's Rule 63 provides as follows:

(d)(1)B. Underground injection permits shall be issued only when the operator shows that there will be no endangerment of an underground source of drinking water.

(d)(5)A.13). for produced fluid disposal wells, a certification from the applicant that the proposed injection zone is non-productive of oil or gas and is not an underground source of drinking water; a sample of formation fluid shall be obtained and an analysis of such fluid sample supplied to the Board upon completion of the well;

(d)(5)A.15). information submitted with the application showing that injection into the proposed zone will not initiate fracturing in the confining zone or cause any movement of fluids into any USDW; the proper demonstration by the applicant that the pressure in the well at the depth of injection will not exceed seventy-five per cent (75%) of the calculated fracture pressure of the formation or upon proper demonstration and submission of evidence, that a sufficient thickness of overlying strata exists between the injection zone and the lowermost USDW to prevent

fracturing into the USDW.

(d)(8)B. Injection pressure at the well head shall not exceed the maximum pressure allowed by the permit. All wells shall not exceed calculated fracture pressure (enhanced recovery wells can be excepted after notice and hearing).

A. The operator shall monitor the nature of the injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics and observe injected pressure, flow rate, and cumulative volume at least with the following frequencies:

I) weekly for produced fluid disposal operations;
ii) monthly for enhanced recovery operations; with the results of (I) and (ii) being reported monthly on Oil and Gas Board Form 14.

Nothing in the MOGB's Rules references approval of aquifer exemptions by the EPA or the required public notice and comment period. It appears from the well file for Well 36-13-1 that the MOGB accepted an unsupported affidavit from an in-house petroleum engineer employed by Coho that the water in the injection zone exceeded 10,000 ppm TDS as sufficient to comply with the federal UIC regulations.

We submitted open records act information requests to the MOGB on March 26, 2021, as follows:

1. Please identify all exempted aquifers in Mississippi under the US Safe Drinking Water Act and the Underground Injection Control Program.
2. Please identify all aquifer exemptions granted by the US Environmental Protection Agency ("EPA") in Mississippi under the US Safe Drinking Water Act and the Underground Injection Control Program.
3. Please explain the State Oil and Gas Board of Mississippi's (the "Board") role and responsibilities in the receiving, processing, evaluating and consideration of applications for aquifer exemptions under the Safe Drinking Water Act's Underground Injection Control Program.
4. Did the EPA grant an aquifer exemption for Laurel Field Well #36-13-1? If the answer is "yes," please provide copies of the following documents:
   a. The granted aquifer exemption and the application for the exemption, including all documentation and technical data submitted in support of the application.
   b. Proof of publication for the public comment period prior to the granting of the exemption and all public comments received.
5. If the EPA did not grant an aquifer exemption for Laurel Field Well #36-13-1, please explain why an aquifer exemption was not required for this well.
6. Please explain the bases for the Board's finding in paragraph 10 of the Board's

Order Number 22-96 dated January 31, 1995, in Docket Number 17-96-139, that "any formation water in the proposed injection interval in said well contains in excess of 10,000 parts per million (ppm) of dissolved solids."

a. Please provide any documents, data and information reviewed by the Board in connection with such finding.

The MOGB responded as follows:

In response to your Mississippi Freedom of Information Request dated March 26, 2021, the response of the Mississippi State Oil & Gas Board ("MSOGB") is provided below:

1. None.
3. None.
4. Please see the attached.
5. No, not to our knowledge.
6. An aquifer exemption is not required for the Laurel Field Unit 36-13 No. I Well because the disposal/injection zone does not meet the criteria for an underground source of drinking water (USDW). Please see the attached MOU for clarification.
7. Please see the attached.

To the responses, the MOGB attached the Order approving the well permit application for Well 36-13-1 (Tab C) and an amendment to the primacy agreement between the MOGB and EPA. Tab A.

The responses confirm there are no exempted aquifers and no aquifer exemptions in Mississippi.

Nothing in the MOGB's responses, including the documents, suggests compliance with the basic requirements of the UIC program regulations.

Our investigation of the history of and practices at Well 36-13-1 reveal the following:

1. Open, unlined earthen pits[3] containing oilfield waste. MOGB inspectors ignored the presence of the pits for two decades, never citing the operators or noting they were a violation on the inspectors' reports. The significance of the pits cannot be overstated. The oil and gas industry has known since the 1930's that use of unlined earthen pits for oilfield

[3] Photos of the pits and other hazardous conditions of Well 36-13-1 are included at Tab H.

waste presents a danger to the environment.[4] Photos of the pits are included at Tab H.

2. Altered inspection reports. We obtained inspection reports for Well 36-13-1 from the MOGB that have had the names of operators inserted and which are dated at a time the operators did not own the well, and in the case of one operator, a decade before it was created as a company. We also have inspection reports that have the names of the operators removed.

3. Despite there having been 600,000 barrels of oilfield waste disposed of in the well, the MOGB cannot produce a single permit to any transporter of the waste, in violation of statute and MOGB rules.

4. A heavily-redacted 2010 Due Diligence Report[5] prepared by an independent environmental consulting firm retained by an operator when it purchased the well proves the well site is contaminated, presents a health risk and has multiple issues that the MOGB has ignored for decades. The Report states that the environmental condition of the Well Site is "poor." The Report also notes (1) the presence of earthen pits with oil "saturated" soil, (2) a severely rusted and partially missing tank roof, (3) oilfield debris buried in the ground,(4) leaking pumps and pipes, and (5) elevated levels of naturally-occurring radioactive material ("NORM") which is known to cause cancer. Despite these and other findings by an independent environmental consulting firm, the MOGB's inspectors have consistently found no problems with or violations at the Well Site. Photos showing the condition of the well site are included at Tab H.

5. A representative of the operator of Well 36-13-1 informed our client that for decades, the operator believed its property line extended well onto our client's property. There are chemical drums buried on our client's property adjacent to the well site. Photos of the drums that are visible at the surface are included at Tab I.[6] Additionally, the operator purchased a parcel adjacent to the well site. The operator buried oilfield debris, including well pipe contaminated with NORM, on the site. *See,* Photos at Tab H. We have affidavits from two nearby residents who observed the operator burying the materials with a trackhoe at night. This information has been reported to the MOGB which took no action to investigate or order remediation.

We believe a broad investigation of other disposal wells will show that these conditions at

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[4] Arnold, John T., "A Thousand Ways Denied: The Environmental Legacy of Oil in Louisiana" (University of Louisiana Press, 2020).

[5] The Due Diligence Report is subject to a Protective Order and is therefore not attached.

[6] We believe ground-penetrating radar will reveal a large amount of oilfield debris and chemical drums buried on this private tract and on the adjacent tract purchased by the operator of Well 36-13-1.

Well 36-13-1 are not uncommon.[7]

In summary, the MOGB has failed in its role as the primary enforcement agency for the SDWA's UIC program, thereby endangering sources of the public's drinking water supply.

CONTAMINATED GROUNDWATER

We installed a groundwater monitoring well on our client's property, immediately adjacent to Well 36-13-1. The well was drilled, developed and sampled according to the EPA's "Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells."

The lab data from the monitoring well - Tab D - reveals the presence of Beryllium, Barium, Mercury, Benzene and Radium-228, all above the Maximum Contaminant Levels ("MCL") under the EPA's National Primary Drinking Water Regulations. Each of these pollutants is known constituents of oilfield produced water. *See,* Tab E for a summary of the health-hazards presented by these substances.

The lab data of the water samples also reveals a very acidic pH (4.06), total dissolved solids ("TDS") of 3,840 (over 7 times the possible action level) and a Chloride level of 736 (three times the possible action level).

The lab data is conclusive proof that the near-surface groundwater at Well 36-13-1 is contaminated by oilfield waste.

The City of Laurel draws public drinking water from depth of 150 feet in a well located approximately one mile from Well 36-13-1.

MAXIMUM INJECTION PRESSURE EXCEEDED

The Order approving Coho's permit application for Well 36-13-1 allows waste to be disposed of in the well at a maximum injection pressure of 682 pounds per square inch. The purpose of limiting the pressure of injection is to avoid fracturing confining rock in the injection zone. Under the EPA's UIC regulations, the well operator is required to submit monthly reports to the MOGB that show the injection pressure and total volume of waste disposed of in the well. We have all of the monthly reports. They reflect that for eighty-six percent of months between 1996 and 2016, the operators either exceeded the maximum injection pressure or reported zero pressure. For the months the operator reported zero pressure, hundreds or thousands of barrels were injected, so there was necessarily pressure exerted to inject. (Because the monthly reports are voluminous, a spreadsheet with the reported numbers is at Tab F).

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[7] *See*, discussion of other wells below.

The MOGB's failure to review the monthly reports allowed injection pressures above the permitted maximum injection pressure to be used for two decades. We retained a petroleum engineer at Mississippi State University to review the facts and render opinions. His opinion is as follows: "Clients provided the author with information that make the likelihood of hydraulic fracturing almost a certainty." "Hydraulic fracturing" means the excessive pressure used to inject fluids into the well caused the confining rock structure above the injection zone to fracture. Fracturing can lead to vertical migration of oilfield waste into other zones, including USDW. Hydraulic fracturing is one of the primary dangers sought to be avoided through the UIC program.

MOGB'S IMPROPER PERMITTING OF COMMERCIAL DISPOSAL WELLS

In Mississippi, there are two types of disposal wells: Commercial and non-commercial. A commercial well is one involving either waste from multiple generators or waste disposal for a fee. *See,* Miss. Code. Ann. § 17-17-3. Non-commercial wells are operated by oil companies to dispose of their own waste only. The distinction is significant because by statute, the Mississippi Department of Environmental Quality ("MDEQ") permits and regulates commercial disposal wells; the MOGB permits non-commercial wells. *See,* Miss. Code Ann. §§ 17–17–47.

In *Howard v. TotalFina E & P USA, Inc.*, 899 So.2d 882, 887-88 (2005), the Mississippi Supreme Court held:

> The [MOGB's] authority does not extend to the regulation of commercial disposal of waste products, like the waste dumped onto the [Plaintiff's] property. The applicable statute unambiguously limits the [MOGB's] authority and jurisdiction to noncommercial disposal of oil field exploration and production wastes. It provides:
>
> > (1) Notwithstanding any other provisions contained in this chapter, the State Oil and Gas board shall continue to exercise the exclusive authority to make rules and regulations and issue permits governing the noncommercial disposal of oil field waste products....
>
> Miss.Code Ann. § 17–17–47 (Rev.2003) (emphasis added). Instead, according to Section 17–17–47, it is the [MDEQ] that has "exclusive authority to regulate commercial disposal of oil field exploration and production of waste products."

See also, Town of Bolton v. Chevron Oil Co., 919 So. 2d 1101, 1109 (Miss. App. 2005) ("Commercial disposal of oil field exploration and production waste is not within the [Mississippi Oil and Gas] Board's jurisdiction.")

There is no readily accessible data that identifies the number of commercial disposal wells in Mississippi, however, the number is believed to be large. The MDEQ has not permitted a single Class I disposal well. The MOGB has therefore permitted all commercial disposal wells. At Tab G is a list of commercial disposal wells improperly permitted by the MOGB. This list is by no means exhaustive, and we believe represents a small fraction of the commercial disposal wells improperly permitted by the MOGB.

We are aware of no delegation of authority to permit and regulate commercial disposal wells from the MDEQ to the MOGB. If it exists, any such delegation would violate plain statutory language segregating jurisdiction over Class II wells between the MDEQ and MOGB.

We note that the MOGB did not disclose to the EPA that it only had jurisdiction over non-commercial disposal wells when it applied for and was granted primacy over the UIC program in Mississippi.

SPCC PROGRAM VIOLATIONS

SPCC is Spill Prevention Control and Countermeasure, and is a regulatory scheme under the Clean Water Act that is administered by the EPA. The purpose of the SPCC is to prevent discharges of oil into navigable waters of the United States and adjoining shorelines. Due to Well 36-13-1's proximity to Tallahoma Creek, it is an SPCC well. SPCC designation requires a detailed spill prevention and countermeasure plan and involves well design and operational procedures. Based on a summary review, there are multiple violations of the SPCC regulations at the well, including lack of a secondary containment system.

Additionally, if a well operator has two spills of at least 42 gallons each (1 barrel = 42 gallons), it is obligated to report the spills to the EPA which will investigate and dictate a remediation plan. Due to the presence and use of open, unlined pits, there have been multiple spills at Well 36-13-1 that exceed 42 gallons. Each time it rains, the operator sends a 150 gallon vacuum truck to the site. The vacuumed liquids are then taken to other disposal wells and injected.

We have a witness who observed a fish kill on Tallahoma Creek. While there are multiple causes of fish kills, pollution is a leading cause.

OTHER WELLS

In the course of investigating Well 36-13-1, we have obtained evidence of similar illegal practices by oil companies and MOGB inaction at other disposal well sites.

1. "Bus Barn Well." The Bus Barn Well was located on the school bus yard for Jones County School District and within 50 yards of the AP Fatheree Vo-Tech and Education Center. A water treatment facility, churches, homes and apartments are located in close proximity to the well. The well is now plugged and abandoned due to leaks. The MOGB's file on this well contains references to a "history of leaks." There is no evidence in the well file that the MOGB conducted any environmental impact testing or ordered the operator to remediate the site.

2. "Boots Smith Yard Well." This disposal well was situated in the service yard of Boots Smith, an oilfield service company. This was a commercial well, improperly permitted by the MOGB. It was converted to a disposal well after a radioactive probe became lodged in the well bore. The well is in close proximity to a large chicken processing

plant, two youth sports complexes, nursing homes and a residential area. The MOGB's file on the well documents a "history of leaks." There is no evidence the MOGB conducted an investigation, performed any environmental impact testing or ordered remediation. The site became the subject of litigation between the purchaser of Boots Smith's assets and Boots Smith's owner. The court file on the case is sealed. However, it is believed one of the terms of a settlement between the parties required Boots Smith's owner to perform a cosmetic clean up of the site.

3. "Summerland Field Well." This well is situated on the banks of the Leaf River, a major watercourse that flows into the Pascagoula River which empties into the Gulf of Mexico. We have first-hand accounts of the well operator burying chemical drums and other oilfield debris at the site and dumping other oilfield debris in the woods.

These and Well 36-13-1 are but four wells on which we have obtained information of reckless and dangerous conduct by oil companies and of willful inaction by the MOGB to enforce rules, regulations and statutes and protect the environment.

HUMAN IMPACT

It is not possible here to adequately state the full scope of human impact caused by the oil companies' illegal practices and the MOGB's failure to enforce the UIC regulations. Well 36-13-1 and the three wells identified above are located adjacent to churches, homes, schools, youth sports fields, nursing homes, a water treatment plan, a food processing company and navigable waterways. We have identified seven cases of cancer among people residing within .3 miles of Well 36-13-1, including two esophageal cancers and multiple leukemias.

D.B. is a 58-year old female who lives .3 miles from Well 36-13-1. Despite having none of the risk factors, she was diagnosed with esophageal cancer in 2016. Her treating physician at the University of Alabama Birmingham informed D.B. that her cancer was likely caused by "chemical exposure." She was informed in April 2016 that her cancer had spread and that she had two months to live. She had chemotherapy, radiation and an Esophagectomy in which a portion of her esophagus was removed. Her stomach now sits on top of her right lung. She had a feeding tube for four weeks following surgery. She takes medication eight times a day, lives with constant nausea and breathing problems and has developed aspiration pneumonia. Due to the removal of muscles and nerves during her surgery, she developed gastroparesis, a disease in which the stomach cannot empty itself of food in a normal fashion. She can no longer enjoy gardening, taking walks with her husband and any activity that requires physical exertion.

D.B. represents but one specific example of the impact of the oil companies' disposal practices.

Tab A

UNDERGROUND INJECTION CONTROL PROGRAM

AMENDED

MEMORANDUM OF AGREEMENT

BETWEEN THE STATE OF MISSISSIPPI

AND

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

I. GENERAL

This Amended Memorandum of Agreement (AMOA) establishes policies, responsibilities and procedures for the State of Mississippi's Underground Injection Control (UIC) Program for Class II injection wells (State Program) as authorized by Section 1425 of Part C of the Safe Drinking Water Act, Pub. L. 93-523, as amended ("SDWA" or "the Act").

This Agreement is entered into by the State Oil and Gas Board of Mississippi and signed by the Supervisor of the State Oil and Gas Board of Mississippi (hereafter, "the State" or "Director"), with the United States Environmental Protection Agency, Region IV and signed by the Regional Administrator (here after "EPA" or "Regional Administrator"). The original Agreement became effective on the date the notice of State Program approval was published by EPA in the Federal Register (Vol. 54, No. 40 PP 8734-8735) on March 2, 1989. This AMOA shall become effective upon the signing by the Director and the Regional Administrator.

This AMOA supersedes the previous MOA between the State and EPA dated October 21, 1988. This Agreement may be modified upon the initiative of the State or EPA. Modifications must be in writing and must be signed by the Director and Regional Administrator.

The State shall administer the UIC program consistent with the State's original submission[1] and this AMOA, the SDWA, current Federal policies and regulations which are applicable to §1425, and any separate working agreements which shall be entered into between the State and the Regional Administrator as necessary for the full administration of the UIC program. The State's administration of the UIC program shall include implementation of all applicable Statewide Rules and Regulations.

For purposes of the State Program the terms "underground source of drinking water" (USDW) and "fresh water" may be used interchangeably. USDW shall be defined as an aquifer or its portion:

(1) (i) which supplies any public water system: or
(ii) which contains a sufficient quantity of groundwater to supply a public water system; and

a. Currently supplies drinking water for human consumption; or

b. Contains fewer than 10,000 mg/l total dissolved solids, and

(2) which is not an exempted aquifer.

Subsequent to program approval an aquifer or portion thereof, which would otherwise meet the definition of a USDW, may be exempted from protection under this program by the Director provided that: (1) the exemption is made in accordance with Sections 144.7 and 146.4 of the Federal UIC regulations, and (2) EPA, the Mississippi Department of Environmental Quality, and the Mississippi State Department of Health approves same.

The Mississippi State Oil and Gas Board will not knowingly grant an exception to any Rule or Order of the Board that will in any way endanger any USDW.

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[1]The State Program submission; for Primary enforcement responsibility includes: (1) a letter from the Governor requesting program approval; (2) a complete program description; (3) a statement of legal authority; (4) Memorandum of Agreement; and (5) copies of all applicable State statutes, regulations and forms.

This Agreement will remain in effect until such time as State primary enforcement responsibility is withdrawn by EPA, according to the provisions of 40 C.F.R. Part 145.34.

If the Administrator revises or amends any requirement of a regulation under Section 1421, the State may demonstrate that the State program meets the requirements of Section 1421(b), and represents an effective program under Section 1425(b). The State may make this alternative showing under Section 1425, but still must do this within 270 days after proper notice of such revision or amendment by the Administrator.

Nothing in this Agreement shall be construed to limit the authority of the EPA to take action pursuant to the SDWA.

II. SHARING OF INFORMATION

EPA shall inform the State within thirty (30) days of receipt of the issuance, and content of Federal statutes, regulations, guidelines, technical standards, policy decisions, directives, judicial decisions and any other factors which might affect the State program. The State shall inform EPA within thirty (30) days of receipt of any proposed or pending modifications to any Statewide Rule or regulations, guidelines, any judicial decisions or administrative actions and known proposed or pending modifications to laws which might affect the State Program and the State's authority to administer the program. The State shall submit copies of such revisions to EPA and within thirty (30) days, inform EPA of any resource allocation changes (e.g., personnel, budget, equipment, etc.) which might affect the State's ability to administer the program.

All information obtained or used in the administration of the State Program, including all UIC permit files and compliance files, shall be available to EPA upon request without restriction.

If information has been submitted to the State under a claim of confidentiality, the State must submit that claim to EPA when providing EPA such information. Any information obtained from the State and subject to a claim of confidentiality will be treated in accordance with 40 C.F.R. Part 2. If EPA obtains information from the State that is not claimed to be confidential, EPA may make that information available to the public without further notice.

III. RESPONSIBILITIES

A. Program Operation

To assure protection of underground sources of drinking water, the Board agrees to take the following actions on new or newly converted injection wells if corrective action is needed on

wells in the area of review but cannot be accomplished by the operator due to different ownership of the wells involved:

1. Deny the permit, permit modification or other such authorization which may be requested of the Board; or,

2. Limit injection pressure(s) so as to prevent the movement of fluid into underground sources of drinking water.

The State will exercise its broad authority under Rule 63 Part 1:B to accomplish the following:

1. Require corrective action in any case where corrective action is needed to assure protection of an underground source of drinking water.

2. Limit the injection pressure of all wells to a pressure that will not exceed the calculated fracture pressure of the confining zone or cause any movement of fluids into any USDW.

Mechanical integrity tests for all Class II wells will be required as specifically described in Rule 63 Part 7.

In accordance with Rule 63 Part 3:C(2) the State may modify, revoke and reissue, or terminate a permit after notice and hearing, if information as to the permitted operation indicates that the cumulative effects on the environment are unacceptable, such as pollution of USDWs. For purposes of the UIC program, fluid migration into a USDW will be interpreted as having an unacceptable cumulative effect on the environment which shall result in modification, revocation and reissuance, or termination of permits.

The comment period for a public notice on a permit application shall be at least 20 calendar days.

The State shall examine each permit file at least once every five years. Such examination shall review the adequacy of financial responsibility, any new wells in the area of review, and the applicability of any new policies, rules, regulations or statutes. During these examinations, or earlier if an operator brings a petition concerning a permit file before the Board, the State shall determine and set a maximum injection pressure limitation for each of the State's permit files that do not already contain this restriction. The date and results of each examination shall be retained in the file.

When the Director has information that a well may be causing fluid movement into or between underground sources of drinking water, he will cause the well to be shut-in and/or take other action as necessary to prevent contamination of USDWs.

The amount of financial instruments established to assure the availability of funds to plug and abandon injection wells shall be based on estimates secured by the wells' owner/operator and confirmed by the State. The estimates shall be based on plugging and abandonment plans approved by the State. Funds received by the State pursuant to the financial responsibility requirements of Rule 63 shall be used for the express purpose of plugging and abandoning the specific injection wells for which the funds were received.

The State has developed criteria for analysis of financial statements and if any additional criteria is deemed necessary it shall be developed in conjunction with, and satisfactory to EPA and the criteria will be followed.

B. Compliance Monitoring

The Director shall conduct periodic inspections of the facilities and activities subject to regulatory requirements. The compliance monitoring inspections shall be performed to assess compliance with all UIC permit conditions or UIC program requirements and include selecting and evaluating a facility's monitoring and reporting program. These inspections shall be conducted to determine the compliance or noncompliance with the issued permits, to verify the accuracy of the information submitted by the permittee in reporting forms and monitoring data, and to verify the adequacy of sampling, monitoring and other methods of providing the information.

The Regional Administrator has provided the State a listing of all wells which have been issued an EPA Class II permit. If the State certifies that the State permit has been reviewed and is in compliance with current State rules, regulations, and statutes, the Regional Administrator will review the EPA permit for compliance. If the operator is in compliance with the EPA permit, the Regional Administrator will terminate the EPA permit and so notify the State.

The State agrees to witness each year at least 75% of the mechanical integrity tests conducted on Class II wells.

The State shall retain records used in the administration of the program for three (3) years (40 C.F.R. Parts 30 and 35) and all mechanical integrity records for five years. In the event that an enforcement action is pending, all records pertaining to such action shall be retained until such action is resolved and three years thereafter.

C. Enforcement for Class II Operation

The State shall enforce the UIC Program in accordance with the enforcement procedures outlined in the program submission and any subsequent enforcement agreements. The State shall take timely and appropriate enforcement actions against any persons in violation of any UIC Program requirement. Violations which may endanger human health will receive immediate and paramount attention.

Inspectors shall report all UIC violations in writing to their immediate supervisor, who shall ensure appropriate follow-up enforcement actions.

In the event the State does not pursue enforcement of a UIC violation, the State shall, upon request, furnish EPA with all information, including but not limited to documents associated with such violation, and the State shall cooperate fully with any EPA investigation or enforcement of such violation. EPA will not take enforcement action without providing prior notice to the State and otherwise complying with Section 1423 of the SDWA.

EPA shall continue to handle the enforcement actions on all wells, permitted or otherwise, which are under an active EPA enforcement action as of the date of this Agreement. EPA shall continue with the enforcement actions on these wells until final resolution.

D. State Reports

The State shall submit a quarterly report on the operation of its Class II program to EPA. The reports will be prepared by the state on a quarterly basis and submitted to the Regional Office within thirty (30) days of the close of each quarter of the Federal fiscal year. The report shall contain the following forms or their contemporary equivalents:

1. EPA Form 7520-1, Part I: Permit Review and Issuance/Wells in Area of Review;

2. EPA Form 7520-2A, Part II: Compliance Evaluation;

3. EPA Form 7520-2B, SNC, Part II: Compliance Evaluation (The State will track and document SNC per Underground Injection Control Guidance #53);

4. EPA Form 7520-3, Part II: Inspection/Mechanical Integrity Testing:

5. EPA Form 7520-4, Part IV: Quarterly Exceptions List Report.

6. A brief narrative summary of enforcement actions taken.

The State shall submit the following reports annually, forty-five (45) days after the end of the Federal fiscal year:

1. An updated inventory of active injection facilities;

2. A narrative report consisting of a detailed description of the State's implementation of the UIC program.

E. EPA Oversight

EPA shall oversee the State's administration of the UIC program on a continuing basis to assure that such administration is consistent with the UIC program submission and all applicable requirements embodied in current regulations, policies and Federal law. EPA will conduct at least one on-site visit to the State's office annually to review program implementation with the Director and his staff.

EPA's annual performance evaluation on the State Program will consist of the following:

1. Review of implementation of the UIC workplan which includes review of resource allocations, meeting commitments and prompt submissions of required reports.

2. Review of State reports and other information supplied by the State to determine State Program consistency with SDWA, applicable regulations, guidance and policies.

EPA shall submit a summary of the evaluation findings, within forty-five (45) days of the visit, to the State outlining the strengths and deficiencies in program performance, and recommendations for improving State operations. The State shall have thirty (30) days from the date of receipt to concur with or comment on the findings and recommendations of the mid-year and end of year evaluations. In addition to the specific oversight activities listed in this section, EPA may, from time to time make written request and the State shall submit specific information and provide access to files necessary for evaluating the State's administration of the UIC program. The State reserves the right to negotiate with EPA on requests that would represent an adverse work load.

The State agrees to provide EPA with copies of the monthly Board docket. The State also agrees to provide EPA with the results of all Board decisions regarding injection wells.

EPA will provide technical assistance to the State on compliance, enforcement and emergency response, with the State taking the lead in such actions. However, nothing in this agreement shall restrict EPA's oversight authority and right to take unilateral enforcement action. EPA shall make reasonable effort to give due notice to the Director of any unilateral enforcement action.

EPA may conduct periodic site and activity inspections on injection operations, giving priority to operations having the greatest potential to endanger public health. EPA will notify the State in writing at least seven days before any such inspection and allow opportunity for the State to accompany EPA on any such inspection. However, if an emergency exists, or for some other reason it is impossible to give advance notification, EPA may waive advance notification to inspect a facility but shall make reasonable effort to contact the Director. In keeping with Section 1445(b)(2) of the Safe Drinking Water Act, the State agrees not to use such information to inform the person whose property is to be entered of the pending inspection. In addition, EPA may periodically accompany Director authorized state personnel during routine well inspections and participate in the performance of file reviews for compliance evaluation purposes.

F. Emergency Action

The Director shall immediately notify the Regional Administrator by telephone, or otherwise, of any endangerment to public health resulting from the actual or threatened direct or indirect injection of fluids into the groundwater of the State.

IV. Signatures

Mississippi State Oil and Gas Board

By A. Richard Henderson

A. Richard Henderson
Supervisor

Date 15 April 1992

U.S. Environmental Protection Agency

By Patricia M Tobin

for Greer C. Tidwell
Regional Administrator

Date May 5, 1992

Tab B

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUL 21 2014

MEMORANDUM

OFFICE OF WATER

SUBJECT: **Enhancing Coordination and Communication with States on Review and Approval of Aquifer Exemption Requests Under SDWA**

FROM: Peter Grevatt, Director
Office of Ground Water and Drinking Water (OGWDW)

TO: Water Division Directors Regions I – X

I. Introduction

More than four thousand aquifer exemptions have been approved over the history of the UIC program, and the vast majority of these have been straightforward actions that have been completed in a timely manner. There are some aquifer exemption decisions, however, where review of the aquifer exemption request has been considerably more complex, due to specific conditions associated with the proposed exemption. In some cases, these issues have led to protracted discussions between EPA and the states, without a clear path for resolution.

The purpose of this memorandum is to promote a consistent and predictable process for the review of Aquifer Exemption requests under the Safe Drinking Water Act (SDWA).[1] EPA has both a direct implementation role and a state partnership role in reviewing and approving aquifer exemption requests. Over the course of the past year, EPA has participated in discussions with a number of states through a Ground Water Protection Council (GWPC) workgroup to review issues associated with more complex aquifer exemption requests and to make recommendations on steps to improve the review process. Based on these discussions, EPA and the participating states agreed on a number of steps to enhance coordination and communication between EPA Regions and state UIC programs regarding proposed aquifer exemptions, as discussed below.

II. Roles and Responsibilities

EPA is responsible for the final review and approval of all aquifer exemption requests, based on the regulatory criteria in 40 CFR 146.4 [attached]. UIC permit applicants that need an aquifer exemption in order to conduct injection activities typically delineate the proposed exempted area and submit the delineation to the primacy agency, along with information to support a determination under 40 CFR 146.4 that the proposed exemption is appropriate. States or tribes with primacy review the application and, if the information submitted supports a determination that an aquifer exemption is warranted, make a designation, provide for public participation, and submit a request for approval of the exemption to the

[1] The substantive and procedural requirements for aquifer exemptions in connection with Class VI wells are not addressed in this memo.

appropriate EPA regional office. Primacy states and tribes are also responsible for issuing the UIC permit that goes with the aquifer exemption request and are the direct point of contact for the owners or operators requesting the permit and exemption. Where EPA directly implements the UIC program, the applicant submits the request directly to EPA, and EPA reviews the applicant's demonstrations and makes the final determination to approve or disapprove the exemption request.

If the aquifer exemption is a non-substantial program revision, the relevant EPA Region either responds by letter to the primacy state or tribe or, where EPA directly implements the program, to the applicant. If the aquifer exemption is a substantial program revision, notice of approval of the aquifer exemption is published in the *Federal Register* after EPA has provided public notice and an opportunity for public comment and a public hearing. Where EPA directly implements the UIC program, regional offices are also responsible for identifying and designating exempted aquifers or portions of aquifers at the request of a UIC permit applicant, issuing public notices, and issuing any related UIC permits following aquifer exemption approval. Regional Administrators are primarily responsible for approving/disapproving non-substantial aquifer exemption requests, and the Administrator is responsible for approving the request if the exemption is a substantial program revision.

III. Recommended Steps for Facilitating the Aquifer Exemption Review and Approval Process

As indicated above, most aquifer exemption requests have clearly met the regulatory criteria in 40 CFR 146.4, and reviews have been completed in a timely manner. There are some aquifer exemption requests, however, that have proven to be considerably more complex to review. These more complex aquifer exemption requests have not been limited to substantial program revisions; in some cases, non-substantial aquifer exemption requests have proved quite complex as well. Typically, these have involved situations where the proposed exempted area is located adjacent to an underground source of drinking water (USDW) that is currently in use, or where the potential future use of the USDW is unclear. The following steps are recommended to help facilitate the aquifer exemption review and approval process:

a. Each Region should adopt and share the attached aquifer exemption checklist with each of your states. OGWDW, in consultation with the Regions and states, developed the attached checklist to facilitate EPA's aquifer exemption review process and documentation. The checklist will help convey to states, tribes, and UIC permit applicants the typical information needed to facilitate EPA's review of an aquifer exemption request.

b. Regions should document their review and analysis of the information in the checklist in a Statement of Basis or decision memo that should be included in the Agency's record of its final action. The Statement of Basis should include explanations of the factual, technical, and legal bases for the determination. Information collected following the template of the checklist should inform the Statement of Basis.

c. In the case of aquifer exemption requests that are expected to be complex, EPA Regions are encouraged to schedule a discussion with the state UIC program managers as early in the process as possible. These discussions will serve to identify any potential technical issues that require additional attention even before the package has been submitted to EPA for review and approval.

d. Regional UIC program managers are encouraged to elevate significant disagreements on AE requests to senior primacy program managers rather than allowing them to persist at the staff level for extended periods of time. While HQ can offer assistance on specific Regional AE decisions, I anticipate that most technical issues can be resolved at the Regional level.

IV. Additional background for Approving and Documenting Aquifer Exemptions

The Safe Drinking Water Act (SDWA) directed EPA to establish an Underground Injection Control (UIC) program to prevent endangerment of Underground Sources of Drinking Water (Section 1421(b)(1)). EPA's regulatory approach to aquifer exemptions was promulgated in a 1980 rulemaking. EPA determined that without aquifer exemptions, certain types of energy production, solution mining, or waste disposal would be severely limited. Thus, the regulatory approach that EPA adopted—a broad definition of covered underground waters coupled with a discretionary exemption mechanism—allows the agency to prevent endangerment consistent with the statute while allowing some case-by-case consideration. This approach protects underground sources of drinking water while also allowing underground injection associated with industrial activities including the production of minerals, oil, or geothermal energy. EPA retains the final approval authority over aquifer exemption decisions regardless of state primacy status.

EPA must follow the regulatory criteria at 40 CFR 146.4 in making aquifer exemption determinations. For the EPA to approve an aquifer exemption, the Agency must first find that the state or, where EPA directly implements the UIC program, the applicant, has demonstrated that the aquifer or the portion of an aquifer identified by the state as exempt "does not currently serve as a source of drinking water" (40 CFR 146.4 (a)). EPA has determined that water that currently serves as a source of drinking water includes water that is being withdrawn in the present moment as well as water that will he withdrawn in the future by wells that are currently in existence. EPA's evaluation of this criterion ensures that water from the exempted area of the aquifer "does not currently serve as a source of drinking water" for nearby drinking water wells as required by 40 CFR 146.4(a).

The second exemption criterion requires EPA to determine either that the aquifer cannot now and will not in the future serve as a source of drinking water or that the total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.[2] The regulations at 40 CFR 146.4(b) describe four (4) potential reasons for making the determination that the aquifer cannot now and will not in the future serve as a source of drinking water. One reason (146.4(b)(1)) is that the aquifer is mineral, hydrocarbon, or geothermal energy producing, or can be demonstrated as part of a permit application to contain minerals or hydrocarbons that are expected to be commercially producible. The other reasons relate to practicality of access to water. EPA is continuing discussions with the GWPC workgroup to better define and communicate the type of data and analyses used to support those determinations. EPA Regions will need to document all reasons and factors they considered in a Statement of Basis or decision memo when making the final aquifer exemption decision. As best management practice, EPA will continue to communicate to the states the importance of documenting aquifer exemption analyses and their decision making process.

Robust recordkeeping and management of decision memos and aquifer exemption data is critically important to support informed decisions related to public and private ground water uses for drinking water. Therefore, in addition to the decision memos and records underlying EPA's approval/disapproval

[2] EPA will fully address the criteria 146.4 (b) and 146.4(c) at a later time, after ongoing discussions with GWPC have concluded.

decisions, it is essential that regions maintain standardized, readily available data on all existing aquifer exemptions. Proper recordkeeping and data management at the regional level will help with mapping and geospatial analysis for greater accessibility and comprehension of the exemption data and ensure that potentially affected parties are made aware of the exempted areas. Additionally it will enhance HQ efforts to facilitate a national tracking mechanism for approved exemptions.

Conclusion

Recognizing that EPA's approval of an aquifer exemption request is typically required prior to issuance of a UIC permit, regional UIC programs should establish early communication with the primacy state to inform EPA's review. The Region should start its review with the information provided in the primacy program's designation and approval request. If questions arise or further information is needed to either supplement the request or clarify specific data points related to the proposed exempted aquifer, the Region should work with the primacy program to obtain this information at the earliest opportunity. The Region should also work expeditiously with the primacy program to resolve any disagreements arising from the aquifer exemption process.

While there are other technical and policy issues associated with aquifer exemptions that are not addressed by this memorandum, I hope that the clarity on the review and determination process for aquifer exemptions provided herein, will help the Agency's effort to achieve national consistency and clarify expectations from states and tribes (and potentially owners or operators) on aquifer exemptions. The Agency will continue to work in consultation with states and stakeholders to promote a consistent and predictable process for the review of aquifer exemption requests under the Safe Drinking Water Act (SDWA).

Attachments

40 CFR 146.4: Criteria for Exempted Aquifers

An aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in § 146.3 may be determined under § 144.7 of this chapter to be an "exempted aquifer" for Class I-V wells if it meets the criteria in paragraphs (a) through (c) of this section. Class VI wells must meet the criteria under paragraph (d) of this section:

(a) It does not currently serve as a source of drinking water; and

(b) It cannot now and will not in the future serve as a source of drinking water because:

(1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.

(2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;

(3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or

(4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or

(c) The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system

(d) The areal extent of an aquifer exemption for a Class II enhanced oil recovery or enhanced gas recovery well may be expanded for the exclusive purpose of Class VI injection for geologic sequestration under § 144.7(d) of this chapter if it meets the following criteria:

(1) It does not currently serve as a source of drinking water; and

(2) The total dissolved solids content of the ground water is more than 3,000 mg/l and less than 10,000 mg/l; and

(3) It is not reasonably expected to supply a public water system.

Aquifer Exemption Checklist

Reviewed by: _____ ***Date*** _____

A- Regulatory Background and Purpose

An aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in § 146.3 may be determined to be an "exempted aquifer". The aquifer exemption criteria at 146.4 must be met as follows:

- Class I-V wells must meet criteria **146.4(a) and 146.4(b)(1)**; or **146.4(a) and 146.4(b)(2)**; or **146.4(a) and 146.4(b)(3)**; or **146.4(a) and 146.4(b)(4)**; or **146.4(a) and 146.4(c).**
- Class VI wells must meet the criteria **146.4(d)**[1].

Regardless of the AE request or the type of injection activity, in all cases, first and foremost a demonstration that the aquifer or portion thereof does not currently serve as a source of drinking water is the required first step in the process. **EPA must evaluate each AE request to ensure the criteria are met prior to approval. EPA should also document its rationale for approving or disapproving each AE request in its statement of basis and, in case of exemptions that are substantial program revisions, EPA must provide public notice and an opportunity for the public to comment and request a public hearing.**

The purpose of this checklist is to ensure that appropriate and adequate information is collected to facilitate review of AE requests, and documentation of AE decisions. Some information described here may not apply to all AE requests.

B- General Information

AE request received by EPA on _____

Is the aquifer exemption Substantial_____ **Non-Substantial**_____
Describe basis for substantial/non-substantial determination_____
Is the aquifer exemption Complex? (Existence of drinking water wells, populated area ...) _____
Did the state or tribe provide public notice and opportunity for public hearing on the aquifer exemption request (144.7 (b)) Y/N
Were there any public comments? Y/N If yes, identify where they may be located_____
Date(s) of notice(s) published_____, Public meeting(s) held_____, Hearing held _____, any notable findings or pending litigation _____
Describe the notice and comment process and the final decision_____
Describe the basis for the decision to exempt the aquifer or the basis for the decision to withhold or deny approval of the exemptions request_____
Any anticipated issues associated with EPA approval or disapproval of the AE request Y/N_____
Any meetings between EPA/States/Tribes/Operator to discuss issues Y/N list_____

Is the request submitted by a primacy state or tribe? Y/N If yes name the State/Tribe/Agency _____ **Contact:**_____
AE identified by the Primacy State or tribe and submitted for EPA review and final determination on _____

Name of the Owner/operator_____
Well/Project Name:_____ **Well Class** _____
Purpose of injection: _____(mineral mining/oil and gas/other)

Where is the proposed aquifer exemption located? Township, Section, Range, Quarter Section or other method used to identify the area _____ Latitude and longitude information _____County_____ City_____ State_____ Add information about distance to nearest Town, County _____

Name of aquifer or portion of aquifer to be exempted _____

_____

[1] Additional Class VI only requirements in 40 CFR 144.7(d)(1) and (2) apply. This checklist does not address those requirements.

Areal extent of the area proposed for exemption_____
Depth and thickness of the aquifer _____
Discuss the total dissolved solid (TDS) content of the aquifer, including the TDS at the top and bottom of the exempted zone, and the locations and depths of all fluids samples taken. _____

C- Regulatory Criteria

An aquifer or a portion thereof may be determined to be an exempted aquifer for Class I-V wells if it meets the criteria in paragraphs (a) –(c) below. Other than EPA approved aquifer exemption expansions that meet the criteria set forth in 146.4(d), new aquifer exemptions for Class VI wells shall not be issued.

146.4: ( ) **(a)** ***Not currently used as a drinking water source*** **and:**

( ) **(b)(1)** It is mineral, hydrocarbon, or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or Class II operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible; or
( ) **(b)(2)** It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical; or
( ) **(b)(3)** It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or
( ) **(b)(4)** It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or
( ) **(c)** TDS is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

( ) **(d)** *The areal extent of an aquifer exemption for a Class II enhanced oil recovery or enhanced gas recovery well may be expanded for the exclusive purpose of Class VI injection for geologic sequestration under § 144.7(d) if it does not currently serve as a source of drinking water; and the TDS is more than 3,000 mg/l and less than 10,000 mg/l; and it is not reasonably expected to supply a public water system.*

1- Demonstration that the aquifer or portion thereof does not currently serve as a source of drinking water per 146.4(a)

Describe the proposed exempted area and how it was determined:_____
_____

TDS:_____ **Top:**_____ **Bottom:**_____
Lithology: _____
Permeability: _____ **Porosity:** _____ **Groundwater flow direction:** _____
Upper and Lower Confining Zone(s) and description of vertical confinement from USDWs:
_____
Oil or mineral production history:_____

Are there any public or private drinking water wells within and nearby the proposed exempted area for which the proposed exempted portion of the aquifer might be a source of drinking water Y/N If yes, list all those wells
_____

- *Include*: pertinent map(s) visually showing the areal extent of exemption boundary, depth and thickness of the aquifer proposed for exemption, all known subsurface structures such as faults affecting the aquifer, and each of the inventoried water well locations by well # or owner name.
- *Include*: Table of all inventoried water wells showing: Well Name/#, Owner, (Private/Public), Contact information, Purpose of well (Domestic, Irrigation, Livestock, etc.), depth of source water, name of aquifer, well completion data, age of well (if known), and the primary source of well data (Applicant/State/Tribe/EPA).
- *Include*: Map showing the areal extent of exemption boundary, all domestic water wells considered potentially down gradient of the exemption and hydraulically connected to the exemption. If wells are deemed horizontally and/or vertically isolated from the exemption, this should be foot noted on the Table as well. Use arrow(s) to indicate the direction and speed of GW in the aquifer proposed for exemption.

- Describe the evidence presented in the application and/or methodology used to conclude GW direction and speed when relevant.
- *Include*: any source water assessment and/or protection areas and designated sole source aquifers located within the delineated area.

What is the appropriate area to examine for drinking water wells? Although guidance 34 says it should be a minimum of 1/4 mile, the determination of the appropriate area is on a case by case basis. Describe area and give a rationale.

Are there any public or private drinking water wells or springs capturing (or that will be capturing) or producing drinking water from the aquifer or portion thereof within the proposed exemption area? Y/N*

- Evaluate the capture zone of the well (s) in the area near the proposed project (i.e., the volume of the aquifer(s) or portion(s) thereof from within which groundwater is expected to be captured by that well).
- A drinking water well's current source of water is the volume (or portion) of an aquifer which contains water that will be produced by a well in its lifetime. What parameters were considered to determine the lifetime of the well?

- (*) If the answer to this question is Yes, therefore the aquifer currently serves as a source of drinking water.

2- Demonstration that the aquifer or portion thereof is mineral, hydrocarbon or geothermal energy producing per 146.4(b)(1)

Did the permit applicant for a Class II or III operation demonstrate as part of the permit applicotion that the aquifer or portion thereof contains minerals or hydrocarbons that, considering their quantity and location are expected to be commercially producible? Did the permit applicant furnish the dota necessary to make the demonstration as required by 40 C.F.R. 144.7(c)(1) and (2)? Summarize this demonstration and dato _____

- Include narrative statement, logs, maps, data and state issued permit.
- If the proposed exemption is to allow a Class II enhanced oil recovery well operation in a field or project containing aquifers from which hydrocarbon were previously produced, commercial producibility shall be presumed by the Director upon a demonstration of historical production having occurred in the project area or field. Many times it may be necessary to slightly expand an existing Class II operation to recover hydrocarbons and an aquifer exemption for the expanded area may be needed. If the expanded exemption for the Class II EOR well is for a well field or project area where hydrocarbons were previously produced, commercial producibility would be presumed.
- For new or existing Class II wells not located in a field or project containing aquifers from which hydrocarbons were previously produced, information such as logs, core data, formation description, formation depth, formation thickness and formation parameters such as permeability or porosity shall be considered by the Director, to the extent available.
- Many Class II injection well permit applicants may consider much information concerning production potential to be proprietary. As a matter of policy, some states/tribes do not allow any information submitted as part of a permit application to be confidential. In those cases where potential production information is not being submitted, EPA would need some record basis for concluding that the permit application demonstrates that the aquifer contains commercially producible minerals or hydrocarbons. For example, the permit application may include the results of any R & D pilot project. In this case, the applicant should state the reasons for believing that there are commercially producible quantities of minerals within the expanded area. Also, exemptions relating to new or existing Class II wells not located in a field or project containing aquifers from which hydrocarbons were previously produced should include the following types of information:
  - a- Production history of the well if it is a former production well which is being converted.
  - b- Description of any drill stem tests run on the horizon in question. This should include information on the amount of oil and water produced during the test
  - c- Production history of other wells in the vicinity which produce from the horizon in question.
  - d- Description of the project, if it is an enhanced recovery operation including the number of wells and there location.

For Class III wells, the Director must require an applicant to furnish data necessary to demonstrate that the aquifer is expected to be mineral or hydrocarbon producing and the Director must consider information contained in the mining plan for the proposed project, such as a map and general description of the mining zone, general information on the mineralogy and geochemistry of the mining zone, analysis of the amenability of the mining zone to the proposed mining

method, and a time-table of planned development of the mining zone. Information to be provided may also include: a summary of logging which indicates that commercially producible quantities of minerals or hydrocarbons are present.

3- Demonstration that the aquifer or portion thereof is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical per 146.4(b)(2)

Is the aquifer or portion thereof situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical? _____

- List evidence in the application showing how this demonstration was made.
- EPA consideration of an aquifer exemption request under this provision would include information related to: The availability of less costly and more readily available alternative supplies, the adequacy of alternatives to meet present and future needs, and costs for treatment (including cost of disposal of treatment residuals) and or development associated with the use of the aquifer.
- The economic evaluation, submitted by the applicant, should consider the above factors, and these that follow:

1. Distance from the proposed exempted aquifer to public water supplies.
2. Current sources of water supply for potential users of the proposed exempted aquifer.
3. Availability, quantity and quality of alternative water supply sources.
4. Analysis of future water supply needs within the general area.
5. Depth of proposed exempted aquifer.
6. Quality of the water in the proposed exempted aquifer.

4- Demonstration that the aquifer or portion thereof is too contaminated per 146.4(b)(3)

Is the aquifer or portion thereof proposed for exemption so contaminated that it would be economically or technologically impractical to render that water fit for human consumption _____

- List evidence in the application showing that the area to be exempted is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption.
- Economic considerations would also weigh heavily in EPA's decision on aquifer exemption requests under this section. Unlike the previous section, the economics involved are controlled by the cost of technology to render water fit for human consumption. Treatment methods can usually be found to render water potable. However, costs of that treatment may often be prohibitive either in absolute terms or compared to the cost to develop alternative water supplies.
- EPA's evaluation of aquifer exemption requests under this section will consider the following information submitted by the applicant:

(a) Concentrations, types, and source of contaminants in the aquifer.
(b) If contamination is a result of a release, whether contamination source has been abated.
(c) Extent of contaminated area.
(d) Probability that the contaminant plume will pass through the proposed exempted area.
(e) Ability of treatment to remove contaminants from ground water.
(f) Current and alternative water supplies in the area.
(g) Costs to develop current and future water supplies, cost to develop water supply from proposed exempted aquifer. This should include well construction costs, transportation costs, water treatment costs, etc.
(h) Projections on future use of the proposed aquifer.

5- Demonstration that the aquifer or portion thereof is located over a Class III well mining area subject to subsidence or catastrophic collapse per 146.4(b)(4)

Is the aquifer or portion thereof proposed for exemption located over a Class III well mining area subject to subsidence or catastrophic collapse?

- List evidence in the application showing that the area to be exempted is located over a Class III well mining area subject to subsidence or catastrophic collapse_____

- Discuss the mining method and why that method necessarily causes subsidence or catastrophic collapse. The possibility that non-exempted underground sources of drinking would be contaminated due to the collapse should also be addressed in the application.

6- Demonstration that the aquifer or portion thereof has TDS more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system per 146.4(c)

Is the TDS of the aquifer or portion thereof proposed for exemption more than 3,000 and less than 10,000 mg/l?_____

Is the aquifer proposed for exemption or portion thereof not reasonably expected to supply a public water system?____

- Identify and discuss the information on which the determination that the total dissolved solids content of the ground water in the proposed exemption is more than 3,000 and less than 10,000 mg/l and the aquifer is not reasonably expected to supply a public water system.
- Include information about the quality and availability of water from the aquifer proposed for exemption. Also, the exemption request must analyze the potential for public water supply use of the aquifer. This may include: a description of current sources of public water supply in the area, a discussion of the adequacy of current water supply sources to supply future needs, population projections, economy, future technology, and a discussion of other available water supply sources within the area.

7- Demonstration that a Class II aquifer exemption may be expanded to Class VI per 146.4(d) *(Refer to additional requirements in EPA's regulations for Class VI aquifer exemptions for this demonstration)*

May the areal extent of an aquifer exemption for a Class II enhanced oil recovery or enhanced gas recovery well be expanded for the exclusive purpose of Class VI injection for geologic sequestration under § 144.7(d)?_____

- List evidence in the application showing an existing Class II operation associated with AE that is being converted into Class VI_____

Tab C

IN THE STATE OIL AND GAS BOARD OF MISSISSIPPI

RE: PETITION OF COHO RESOURCES, INC. FOR AUTHORITY TO REENTER AND TO COMPLETE THE EXISTING LAUREL FIELD 36-13 NO. 1 WELL AS AN APPROVED CLASS II INJECTION WELL AND TO REDESIGNATE SAID WELL AS THE LAUREL FIELD 36-13 NO. 1 WASTE WATER WELL, LAUREL FIELD, JONES COUNTY, MISSISSIPPI

FILED FOR RECORD

JAN 31 1996

STATE OIL AND GAS BOARD
W. R. Lewis, Supervisor

DOCKET NO. 17-96-139

ORDER NO. 22-96

ORDER

This day this matter came on for hearing before the State Oil and Gas Board of Mississippi on the Petition of Coho Resources, Inc. requesting authority to reenter and to complete the existing Laurel Field 36-13 No. 1 Well, Laurel Field, Jones County, Mississippi, as an approved Class II injection well; for authority to utilize said well for the downhole injection and disposal of various drilling and produced fluids brought to the surface in association with the drilling, completion, recompletion and/or reworking of wells; and for related relief, said hearing being called for such purpose; and

WHEREAS, the Board finding that due, proper and legal notice of the meeting of the Board for the purpose of considering and taking action with respect to such matter was given in the manner and way provided by law and the Rules and Regulations of this Board; that due, legal and sufficient Proofs of Publication are on file with the Board in said matter; and that the Board has full jurisdiction of the subject-matter to hear and determine same; and

WHEREAS, pursuant to said notice, a public hearing was held by the said Board in the Hearing Room of the Mississippi State Oil and Gas Board located at 500 Greymont Avenue, Suite E, Jackson,

Ex. 2

Mississippi, commencing at 9:30 o'clock, A. M. on January 17, 1996, at which hearing all persons present who desired to be heard on said matter were heard and all testimony and documentary evidence duly considered by those present at said hearing; and

WHEREAS, the Board having considered the Petition and the evidence, and being fully advised in the premises, is of the opinion and finds that the relief requested by the Petitioner should be and the same is hereby granted. The Board further finds and determines as follows:

1.

The Board finds that the Petitioner is the present owner of the operating rights in and to the existing Laurel Field 36-13 No. 1 Well located on a former 40-acre oil drilling and production unit in the Laurel Field, Jones County, Mississippi, comprised of the following described lands:

> SW 1/4 of SW 1/4 of Section 36, Township 9 North, Range 12 West, Jones County, Mississippi, Second Judicial District.

2.

The Board finds that the location of the Laurel Field 36-13 No. 1 Well on the above described former 40-acre oil unit is as follows:

> 800.0 feet from the West line and 700.0 feet from the South line of Section 36, Township 9 North, Range 12 West, Jones County, Mississippi, Second Judicial District.

3.

The Board finds that the Laurel Field 36-13 No. 1 Well was originally permitted on October 13, 1992 (Drilling Permit No. 71) as the Venture Oil & Gas, Inc. - Laurel Field 36-13 No. 1 Well. Said well was permitted to a total depth of 10,500 feet below the surface to test the Paluxy Sand Oil Pool. The well tested non-commercial of oil, gas or other hydrocarbons and was subsequently

plugged and abandoned by Venture Oil & Gas, Inc. Coho Resources, Inc. subsequently acquired all of the operating rights of Venture Oil & Gas, Inc. in and to said well.

4.

The Board finds that the Petitioner should be authorized to reenter and to complete the Laurel Field 36-13 No. 1 Well as a duly approved Class II injection well and to utilize said well for the downhole injection and disposal of various drilling and produced fluids brought to the surface in association with the drilling, completion, recompletion and/or reworking of Coho Resources, Inc.-operated wells within the Laurel Field and other Mississippi fields in the vicinity. The Board finds that an injection interval should be approved in said well within the Lower Wilcox Formation at a depth between 3200 feet and 4080 feet below the surface in said well. In addition, the Board finds that the Petitioner should be authorized to add injection perforations at selected intervals within the Lower Wilcox Formation in said well, all within the proposed injection zone.

5.

The Board finds that the shallowest zone productive of oil, gas and other hydrocarbons within the Laurel Field occurs in the 6670' Stanley Sand of the Eutaw Formation at a measured depth of approximately 6650 feet below the surface. The Board finds that the Laurel Field 36-13 No. 1 Well has previously tested non-commercial with no shows of oil, gas or other hydrocarbons within the proposed injection interval. The Board finds that the proposed injection interval in said well is non-productive of oil, gas or other hydrocarbons within the Laurel Field.

6.

The Board finds that the base of the lowermost Underground Source of Drinking Water ("USDW") in the Laurel Field occurs in the Wilcox Formation at a depth of approximately 2325 feet below the surface as indicated on the electric log of the Central Oil Company

- Unit 1-10 No. 1 Well. The Board finds that the proposed injection interval for the disposal of drilling and produced fluids in the Lower Wilcox Formation in said well is separated from the lowermost Underground Source of Drinking Water ("USDW") by an impermeable confining zone. The Board finds that the injection of drilling and produced fluids into the proposed injection interval in said well will not result in the endangerment of any Underground Source of Drinking Water ("USDW"), as defined by Statewide Rule 63, and will not be detrimental to any producible oil-bearing sands or pools or any freshwater-bearing sands in the field or area.

7.

The Board additionally finds that approximately 875 feet of confining strata exist between the base of the lowermost Underground Source of Drinking Water ("USDW") and the topmost proposed injection perforations in said well. The Board finds that this confining strata is of sufficient thickness to authorize the Petitioner to utilize a Maximum Injection Pressure in said well not to exceed 682 psi, which is one hundred percent (100%) of the calculated reservoir fracture pressure in said well. The Board finds that authorizing a Maximum Injection Pressure not to exceed 682 psi to be utilized in said well will cause no fracturing into any Underground Source of Drinking Water ("USDW") and will not result in the endangerment of any freshwater-bearing sands in the field or area.

8.

The Board further finds that the Petitioner should be authorized to utilize a Maximum Injection Rate in said well limited only by the surface injection pressure required to inject into said well utilizing a Maximum Injection Pressure not to exceed 682 psi, or 100% of the calculated reservoir fracture pressure. In other words, there should be no daily volumetric limitations imposed upon the Maximum Injection Rate which may be utilized in said well.

9.

The Board finds that the fluids to be injected into said well will consist of drilling and produced fluids brought to the surface in association with the drilling, completion, recompletion and/or reworking of various Coho Resources, Inc.-operated wells within the Laurel Field and from other Mississippi fields in the vicinity. The Board finds that these drilling and produced fluids will consist primarily of produced waters from various oil-producing formations, spent treatment fluids from well stimulation work and fluids consisting of drilling muds and other waste products and deleterious substances utilized in conjunction with drilling and reworking operations on Coho Resources, Inc.-operated wells in the area.

10.

The Board finds that any formation water in the proposed injection interval in said well contains in excess of 10,000 parts per million (ppm) of dissolved solids.

11.

The Board finds that the Laurel Field 36-13 No. 1 Well, as reentered and completed as an approved Class II injection well, will be equipped with a retrievable injection packer set at a depth of 3870 feet below the surface in said well. Competent cement will be set behind the pipe in said well extending at least 100 feet above the packer. In addition, the packer will be set within 150 feet of the topmost injection perforations in said well, all as required by Statewide Rule 63.

12.

The Board further finds that the Laurel Field 36-13 No. 1 Well, as reentered and completed as an approved Class II injection well, should be redesignated as the Laurel Field 36-13 No. 1 Waste Water Well.

13.

The Board finds that the Laurel Field and other Coho

Resources, Inc.-operated fields in the vicinity are producing oil and other hydrocarbons in numerous wells and that additional fluids disposal capacity is critically needed. The Board finds that the approval of authority to reenter and to complete the Laurel Field 36-13 No. 1 Well as an approved Class II injection well; the redesignation of said well as the Laurel Field 36-13 No. 1 Waste Water Well; and the utilization of said well for fluids disposal purposes into the approved injection interval, will promote conservation, will prevent waste, will avoid the drilling of unnecessary wells, and will fully protect the co-equal and correlative rights of all parties in interest. In addition, the Board finds that the granting of the relief requested will facilitate the more efficient and economical operation of said fields.

14.

In connection with this Petition, the Board finds that the Petitioner has prepared and filed with the Mississippi State Oil and Gas Board the duly executed Affidavit of a Professional Engineer. Included in and made a part of that Affidavit are the following exhibits, to-wit: (1) the Basic Information Required by Statewide Rule 63; (2) a Wellbore Schematic depicting the current surface and downhole equipment and construction features of the Laurel Field 36-13 No. 1 Well; (3) a Wellbore Schematic depicting the proposed surface and downhole equipment and construction features of said well; (4) an Open Hole Well Log of the Central Oil Company - Unit 1-10 No. 1 Well depicting the base of the lowermost USDW; (5) an Open Hole Well Log of the Laurel Field 36-13 No. 1 Well depicting the proposed injection interval; (6) Monitoring Program; (7) Plan for Well Failure; (8) Operating Data; (9) Injection Procedures; (10) a Topographic Map depicting a 1/4 mile radius within the Area of Review; (11) an Area of Review Map indicating that there are no other existing wells within a 1/4 mile radius of the Laurel Field 36-13 No. 1 Well; (12) a Statement of

Hydrocarbon Non-Productivity; (13) a PROPOSED PLAN OF WORK; and (14) a Plan for Plugging & Abandoning Well, including estimated plugging and abandonment costs, copies of all of which are incorporated herein and made a part hereof by reference.

15.

The Board finds that the Proposed Wellbore Schematic and the PROPOSED PLAN OF WORK set forth above describe the procedures which the Petitioner proposes to utilize in reentering and completing the Laurel Field 36-13 No. 1 Well as an approved Class II injection well.

16.

The Board finds that the Petitioner has previously filed with the Mississippi State Oil and Gas Board a duly certified copy of its FINANCIAL STATEMENT which has been approved by the Board as fulfilling the Proof of Financial Responsibility requirements of Statewide Rule 63.

IT IS, THEREFORE, ORDERED AND ADJUDGED by the State Oil and Gas Board of Mississippi as follows:

(1) That Coho Resources, Inc. should be and the same is hereby authorized to reenter and to complete the existing Laurel Field 36-13 No. 1 Well, Laurel Field, Jones County, Mississippi, as an approved Class II injection well through an approved injection interval in the Lower Wilcox Formation at a depth between 3200 feet and 4080 feet below the surface in said well;

(2) That the Laurel Field 36-13 No. 1 Well should be and the same is hereby redesignated as the Laurel Field 36-13 No. 1 Waste Water Well, Laurel Field, Jones County, Mississippi;

(3) That Coho Resources, Inc. should be and the same is hereby designated as the operator of the redesignated Laurel Field 36-13 No. 1 Waste Water Well;

(4) That Coho Resources, Inc., as operator, should be and the same is hereby authorized to add additional injection perforations at selected intervals within the approved injection zone of the

Lower Wilcox Formation in said well with the topmost injection perforations to be placed within 150 feet of the well packer, all as required by Statewide Rule 63;

(5) That Coho Resources, Inc., as operator, should be and the same is hereby authorized to utilize a Maximum Injection Pressure in said well not to exceed 682 psi, which is 100% of the calculated reservoir fracture pressure in said well;

(6) That Coho Resources, Inc., as operator, should be and the same is hereby authorized to utilize a Maximum Injection Rate in said well limited only by the surface injection pressure required to inject into said well utilizing a Maximum Injection Pressure not to exceed 682 psi; and

(7) That Coho Resources, Inc., as operator, should be and the same is hereby authorized to utilize the redesignated Laurel Field 36-13 No. 1 Waste Water Well for the downhole injection and disposal of drilling and produced fluids brought to the surface in association with the drilling, completion, recompletion and/or reworking of various Coho Resources, Inc. - operated wells within the Laurel Field and other Mississippi fields in the vicinity.

IT IS FURTHER ORDERED AND ADJUDGED that Coho Resources, Inc. shall acquire all other permits, if any, required by any other permitting authority.

ORDERED AND ADJUDGED this the 17th day of January, 1996.

MISSISSIPPI STATE OIL AND GAS BOARD

By: Joseph S. Ricaaro
CHAIRMAN

ORDER PREPARED BY:

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Tab D

ALLEN ENGINEERING AND SCIENCE

TABLE 4
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - APRIL 30, 2021
BAUCUM WEST TRACT - LAUREL, MISSISSIPPI

PARAMETER	Possible Action Levels[1] (ppm or pCi)	CONCENTRATION (ppm)[2]				
Sample ID:		BAU-GW-AP1	Blind Dup	TW-1	TW-2	TW-3
Sample Location:		near TW-2		N. Tanks	N. Earth Pits	North TW-2
Screen Interval (ft. bls):		17 - 22		10 -20	10 - 20	10 - 20
FIELD SCREENING RESULTS						
Conductivity (us/cm)	*N/A*	**6,454**	--	**833**	**976**	**337**
pH	*N/A*	**4.06**	--	**6.36**	**5.04**	**6.29**
ORP	*N/A*	**133**	--	**82.2**	**307.5**	**58.9**
DO	*N/A*	**0.21**	--	**4.86**	**3.58**	**5.19**
NTUs	*N/A*	**1.71**	--	**28.14**	**25.85**	**164.5**
WET CHEMISTRY TESTING						
Total Dissolved Solids (TDS)	*500*	3,840	4,220	N/A[5]	N/A	N/A
Chloride	*250*	736	718	N/A	N/A	N/A
TOTAL METALS (Method 6010 / 7471)						
Aluminum	*36.5*	**5.98**	**5.80**	N/A	N/A	N/A
Antimony	*0.006*	< 0.060	< 0.060	N/A	N/A	N/A
Arsenic	*0.050*	< 0.010	< 0.010	N/A	N/A	N/A
Barium	*0.004*	**9.67**	**9.31**	N/A	N/A	N/A
Beryllium	*0.005*	0.037	0.036	N/A	N/A	N/A
Cadmium	*0.005*	< 0.005	< 0.005	N/A	N/A	N/A
Calcium	--	**593**	**620**	N/A	N/A	N/A
Chromium	*0.100*	< 0.010	< 0.010	N/A	N/A	N/A
Cobalt	*2.19*	**0.205**	**0.198**	N/A	N/A	N/A
Copper	*1.30*	< 0.050	**0.0328**	N/A	N/A	N/A
Iron	*11.0*	**0.404**	**0.340**	N/A	N/A	N/A
Lead	*0.015*	**0.0121**	**0.0133**	N/A	N/A	N/A
Magnesium	--	**356**	**340**	N/A	N/A	N/A
Manganese	*0.730*	3.33	3.22	N/A	N/A	N/A
Nickel	*0.730*	**0.392**	**0.379**	N/A	N/A	N/A
Potassium	--	**15.3**	**15.0**	N/A	N/A	N/A
Selenium	*0.050*	< 0.020	< 0.020	N/A	N/A	N/A
Silver	*0.183*	< 0.010	< 0.010	N/A	N/A	N/A
Sodium	--	**229**	**222**	N/A	N/A	N/A
Thallium	*0.002*	< 0.010	< 0.010	N/A	N/A	N/A
Vanadium	*0.256*	< 0.050	< 0.050	N/A	N/A	N/A
Zinc	*11.0*	**0.417**	**0.402**	N/A	N/A	N/A
Mercury	*0.002*	**0.0255**	**0.0244**	N/A	N/A	N/A

TABLE 4
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - APRIL 30, 2021
BAUCUM WEST TRACT - LAUREL, MISSISSIPPI

PARAMETER	Possible Action Levels[1] (ppm or pCi)	CONCENTRATION (ppm)[2]				
Sample ID:		BAU-GW-AP1	Blind Dup	TW-1	TW-2	TW-3
Sample Location:		near TW-2		N. Tanks	N. Earth Pits	North TW-2
Screen Interval (ft. bls):		17 - 22		10 -20	10 - 20	10 - 20
VOLATILE ORGANIC COMPOUNDS (Method 8260)						
Benzene	*0.005*	**0.0155**	**0.0171**	N/A	N/A	N/A
Toluene	*1.0*	< 0.005	< 0.005	N/A	N/A	N/A
Ethylbenzene	*0.700*	**0.0053**	**0.0052**	N/A	N/A	N/A
Xylenes	*10.0*	**0.009**	**0.0091**	N/A	N/A	N/A
Naphthalene	*0.0062*	< 0.005	< 0.005	N/A	N/A	N/A
All Other VOCs	*39.1*	*< 0.002 to < 0.010*	*< 0.002 to < 0.011*	N/A	N/A	N/A
RADIOCHEMISTRY (EPA 904) (pCi/L)[3,4]						
Radium-228	*5*	**62.7 ± 11.5**	**81.3 ± 14.8**	N/A	N/A	N/A

Notes:

[1] Possible Action Levels associated with metals and rad parameters via the Mississippi Department of Environmental Quality (MDEQ) Tier I Unrestricted Use Target Remedial Goal (TRG) standards for soil (2/28/2002) in parts per million (ppm) and maximum acceptable soil contamination levels for NORM per Part 3.a on page 107 of Chapter 11 of the Regulations for the Control of Radiation in Mississippi (MSDOH).

[2] Concentrations are presented and **bold-highlighted** for only detectable constituents in parts per million (ppm). Refer to lab report for relative dilutions.

[3] Picocuries per liter

[4] Negative results are assumed zero. Laboratory software determined error intervals using the square root of the sample area counts and the background counts.

[5] Not Applicable (N/A) per project scope or field decisions.

Tab E

Tab E

Summary of Health Hazards of Pollution Constituents in Groundwater Adjacent to Well 36-13-1

Radium 228

Radium is formed when uranium and thorium undergo radioactive decay in the environment. Radium emits energy in the form of alpha particles and gamma rays, and will also decay to form radon. Radium in drinking water is of primary concern because this radiation may cause cancer, kidney damage and birth defects. Additionally, the decay of radium into radon presents another contaminant of health concern in drinking water as well as in the air.

If inhaled as dust or ingested as a contaminant, risk is increased for several diseases, including lymphoma, bone cancer, and hematopoietic (blood-formation) diseases, such as leukemia and aplastic anemia. These effects take years to develop. If exposed externally to Radium's gamma radiation, risk of cancer is increased in essentially all tissues and organs. However, in the environment, the greatest risk associated with radium is actually posed by its direct decay product radon. Radon has been shown to cause lung cancer.

The EPA has set the MCL for Radium-228 at 5 ppm. The level of Radium-228 found in the groundwater samples is 62.7 ppm. With a half life of 6.7 years, the Radium-228 found in the groundwater samples will remain above the MCL for over 20-years.

Source: https://semspub.epa.gov/work/11/176334.pdf

Benzene

Benzene is a natural part of crude oil. Acute (short-term) inhalation exposure of humans to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and, at high levels, unconsciousness. Chronic (long-term) inhalation exposure has caused various disorders in the blood, including reduced numbers of red blood cells and aplastic anemia. Reproductive effects have been reported for women exposed by inhalation to high levels, and adverse effects on the developing fetus have been observed in animal tests. Increased incidence of leukemia (cancer of the tissues that form white blood cells) is linked to bezene. EPA has classified benzene as known human carcinogen for all routes of exposure.

The EPA's MCL for Benzene is .005 ppm. The groundwater samples contained Benzene at .0155 ppm, or three times the MCL.

Sources: https://www.epa.gov/sites/default/files/2016-09/documents/benzene.pdf
https://www.cancer.org/cancer/cancer-causes/benzene.html

Mercury

Mercury exposure at high levels can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. High levels of methylmercury in the bloodstream of babies developing

in the womb and young children may harm their developing nervous systems, affecting their ability to think and learn.

The level of Mercury in the groundwater samples is 12.75 times the EPA's MCL of .002 ppm.

Source: https://www.epa.gov/mercury/basic-information-about-mercury

Beryllium

The EPA has found short-term exposure to Beryllium above the MCL to cause inflammation of the lungs when inhaled. Long-term exposure to Beryllium has the potential to damage the bones and lungs and cause cancer.

The EPA has set the MCL for Beryllium at .005 ppm. The groundwater samples contained Beryllium level of .037 ppm, or over seven times the MCL.

Source: https://archive.epa.gov/water/archive/web/pdf/archived-consumer-factsheet-on-beryllium.pdf

Barium

Barium is found in drilling mud used in the oil industry. Short-term effects of exposure include gastrointestinal disturbances and muscle weakness. Long-term effects not adequately studied.

The EPA's MCL for Barium is .004 ppm; the groundwater samples contained Barium at 9.67, or 2,417 times the MCL.

Source: National Service Center for Environmental Publications (NSCEP) "Barium: Fact Sheet on a Drinking Water Chemical Contaminant"

Tab F

Injection Pressures for Laurel Field Well 36-13-1 Reported to MOGB

Fracture/Maximum Injection Pressure Per Permit: 682

	Bbl	Pressure
Jun-96		
Jul-96	592	0
Aug-96	4521	0
Sep-96	6067	0
Oct-96	0	0
Nov-96	0	0
Dec-96	0	0
Jan-97	2248	0
Feb-97	1337	0
Mar-97	2547	0
Apr-97	0	0
May-97	1341	0
Jun-97	0	0
Jul-97	0	0
Aug-97	1502	0
Sep-97	0	0
Oct-97	128	0
Nov-97	1419	0
Dec-97	1088	0
Jan-98	670	0
Feb-98	4040	0
Mar-98	2411	0
Apr-98	2058	0
May-98	1625	0
Jun-98	3860	0
Jul-98	3860	0
Aug-98	1499	0
Sep-98	1780	0
Oct-98	885	0
Nov-98	883	0
Dec-98	124	0
Jan-99	669	0
Feb-99	472	0
Mar-99	147	0
Apr-99	147	0
May-99	683	0
Jun-99	1443	0
Jul-99	1623	0
Aug-99	809	0
Sep-99	809	0
Oct-99	1283	0
Nov-99	641	0
Dec-99	411	0

Coho Resources

Reported Pressure 0

Reported Pressure in excess of maxium injection/fracture pressure

*86% of reported pressures either 0 or in excess of maximum injection/ fracture pressure

Jan-00	1818	0
Feb-00	1818	0
Mar-00	1818	0
Apr-00	755	0
May-00	1367	0
Jun-00	1165	0
Jul-00	546	0
Aug-00	1991	0
Sep-00	2169	0
Oct-00	2449	0
Nov-00	2418	0
Dec-00	2819	0
Jan-01	1137	0
Feb-01	1026	0
Mar-01	294	0
Apr-01	587	0
May-01	1172	0
Jun-01	1037	0
Jul-01	1205	0
Aug-01		0
Sep-01	528	0
Oct-01	833	0
Nov-01	335	0
Dec-01	1488	0
Jan-02	2378	0
Feb-02	2245	0
Mar-02	820	0
Apr-02	2419	0
May-02	1354	0
Jun-02	1094	0
Jul-02	2886	0
Aug-02	0	0
Sep-02	323	0
Oct-02	2386	0
Nov-02	1086	0
Dec-02	446	0
Jan-03	1113	0
Feb-03	1881	0
Mar-03	508	800
Apr-03	605	400
May-03	649	400
Jun-03	368	400
Jul-03	596	400
Aug-03	296	800
Sep-03	500	811
Oct-03	519	450
Nov-03	1357	400

Denbury Resources

TMR Exploration

Dec-03	0	0
Jan-04	794	400
Feb-04	330	400
Mar-04	379	400
Apr-04	400	0
May-04	600	449
Jun-04	2186	800
Jul-04	2459	620
Aug-04	5481	700
Sep-04	900	600
Oct-04	2322	600
Nov-04	2461	600
Dec-04	1643	600
Jan-05	2849	600
Feb-05	2325	700
Mar-05	2755	700
Apr-05	4134	600
May-05	2078	600
Jun-05	3569	700
Jul-05	2859	700
Aug-05	2136	650
Sep-05	2275	675
Oct-05	1968	600
Nov-05	2466	700
Dec-05	454	600
Jan-06	364	650
Feb-06	956	600
Mar-06	2293	600
Apr-06	2181	620
May-06	2129	650
Jun-06	2166	650
Jul-06	3525	700
Aug-06	4587	700
Sep-06	3670	644
Oct-06	2856	666
Nov-06	3474	682
Dec-06	3515	700
Jan-07	3973	700
Feb-07	5107	700
Mar-07	3410	700
Apr-07	3579	700
May-07	2642	700
Jun-07	3616	700
Jul-07	3616	700
Aug-07	3588	700
Sep-07	2244	700
Oct-07	3706	700

Ensight Energy Management

Comstock Oil and Gas

Nov-07	1054	700
Dec-07	466	700
Jan-08	2244	700
Feb-08	2321	700
Mar-08	5132	700
Apr-08		
May-08	2157	700
Jun-08	2313	700
Jul-08	928	700
Aug-08	2343	700
Sep-08	2288	700
Oct-08	998	700
Nov-08	1062	700
Dec-08		
Jan-09	1104	700
Feb-09	543	700
Mar-09	700	700
Apr-09	900	700
May-09	846	700
Jun-09	784	700
Jul-09	1144	700
Aug-09	1451	700
Sep-09	1778	700
Oct-09	2559	700
Nov-09	2360	700
Dec-09	1628	700
Jan-10	1498	700
Feb-10	1131	700
Mar-10	1490	700
Apr-10	2579	700
May-10	1698	700
Jun-10	1747	700
Jul-10	2639	700
Aug-10	1238	700
Sep-10	2057	700
Oct-10	838	700
Nov-10	2456	700
Dec-10	1280	700
Jan-11	3287	700
Feb-11	4886	700
Mar-11	2898	700
Apr-11	1643	700
May-11	1797	700
Jun-11	2666	700
Jul-11	3271	700
Aug-11	211	700
Sep-11	1476	700

Petro Harvester Operating

Oct-11	913	700
Nov-11	1779	700
Dec-11	2831	700
Jan-12	4252	700
Feb-12	5104	700
Mar-12	5574	700
Apr-12	4994	700
May-12	3645	700
Jun-12	5520	700
Jul-12	5337	700
Aug-12	5034	700
Sep-12	5088	700
Oct-12	6417	700
Nov-12	5439	700
Dec-12	5866	700
Jan-13	6913	700
Feb-13	6162	700
Mar-13	4371	700
Apr-13	3021	700
May-13	1542	700
Jun-13	1799	700
Jul-13	2117	700
Aug-13	2154	700
Sep-13	1082	700
Oct-13	2071	700
Nov-13	2790	0
Dec-13	328	0
Jan-14	749	0
Feb-14	470	0
Mar-14	1703	0
Apr-14	215	0
May-14	100	0
Jun-14	617	0
Jul-14	1086	0
Aug-14	727	0
Sep-14	156	0
Oct-14	554	0
Nov-14	387	0
Dec-14	288	0
Jan-15	567	0
Feb-15	655	0
Mar-15	799	0
Apr-15	696	0
May-15	629	0
Jun-15	829	0
Jul-15	893	0
Aug-15	683	0

Sep-15	802	0
Oct-15	1090	0
Nov-15	610	0
Dec-15	614	0
Jan-16	522	0
Feb-16	756	0
Mar-16	468	0
Apr-16	1281	0
May-16	1066	0
Jun-16	1355	0
Jul-16	1058	0
Aug-16	268	0
Sep-16	519	0
Oct-16	0	0
TOTAL BARRELS	**436490**	

Notes:

1. Yellow shows likely inaccurate reporting; same number of barrels on consecutive months
2. Consecutive months of same reported pressure, e.g. 700, likely inaccurate

Tab G

COMMERCIAL SALTWATER DISPOSAL WELLS PERMITTED BY MOGB

1. W & S Services, LLC
   API No. 23065201230000
   Permitted to Johnny Stringer Moving & Storage, Inc. on 4/21/93
   (See list of Stringer's Oilfield Services "Salt Water Customers")

2. Kelly Industries, Inc.
   API No. 230172004
   Permitted to T.K. Stanley, Inc.

3. T.K. Stanley, Inc. on 10/6/14
   API No. 2306520860

4. Deeprock Disposal Services, LLC
   API No. 23067205890100
   Permitted to G.B. Boots Smith Corporation
   (Rule 63 Disclosure: "This is to be a service company well. The water injected from this well will be from various wells serviced by this company")

5. Deeprock Disposal Services, Inc.
   API No. 23095000520000
   Permitted to T.K. Stanley, Inc. on 9/20/89

6. Longbranch Energy, LP (permitted by final order dated 10/30/14)
   API No. 23157220330000
   (Order states: "as an approved Class II commercial saltwater disposal well . . . .";
   Affidavit states: "The proposed disposal well will adequately receive an average of 6000 barrels of fluid produced in connection with the production of hydrocarbons by other operators in Mississippi")

7. Champion Oilfield Service, LLC (permitted 10/1/07)
   API No. 23023208271000
   (Order states: "said well, as converted, for the downhole injection and disposal of saltwater and other produced fluids brought to the surface in association with the drilling and operation of various third-party operated oil and gas wells located primarily in the East Mississippi area.")

8. Big River Oilfield Services, LLC (permitted on 12/08/14)
   API No. 23157222260000
   (Order states: "Petitioner seeks authority to drill the Ford SWD Well No. 1 (the "Well") as a commercial saltwater disposal well . . . .")

9. Produced Water Transfer 1, LLC (permitted to Longbranch Energy, LP on 7/08/14)
   API No. 23157220920000

(Caption of Order states: "PETITION OF LONGBRANCH ENERGY, LP FOR AUTHORITY TO DRILL THE LONGBRANCH NO. 1 SWD WELL AS AN APPROVED CLASS II COMMERCIAL SALTWATER DISPOSAL WELL . . . .")

Commercial Class II disposal wells also permitted to:

10. Double Down Disposal, LLC

11. Injection Disposal Service, LLC

12. Cornwell Well Service, Inc.

Tab H-1

Tab H-2

Tab H-3

Tab H-4

Tab H-5